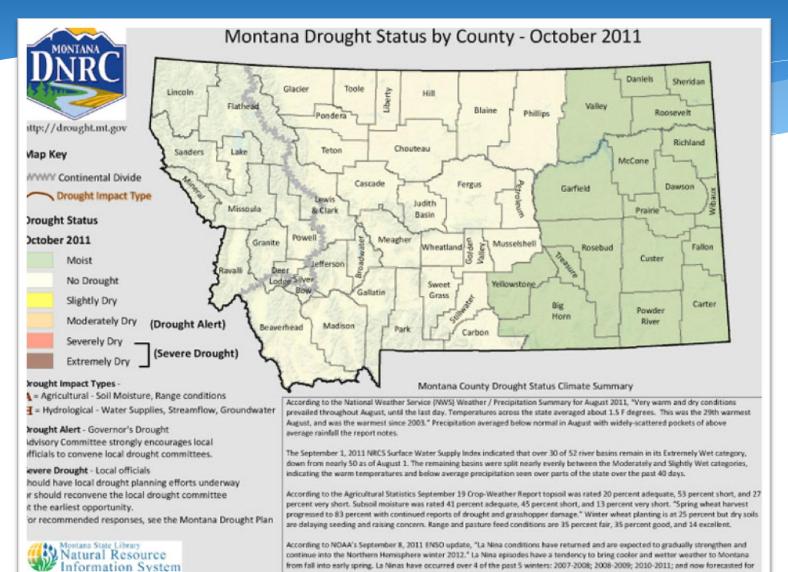


#### Montana Drought Status October 2011



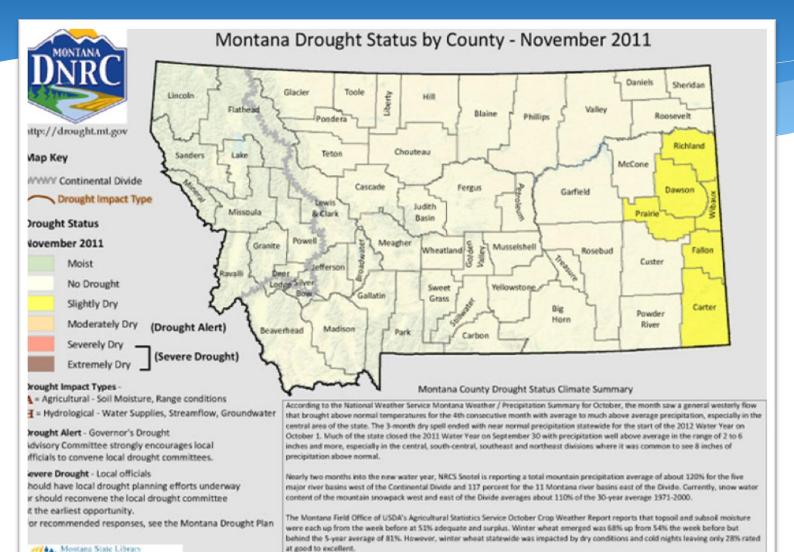
2011-2012. The winter of 2009-2010 saw an El Nino, ENSO's positive phase. Current Climate Prediction Center long-lead climate maps

the // neic mt acu/drought/



Natural Resource Information System

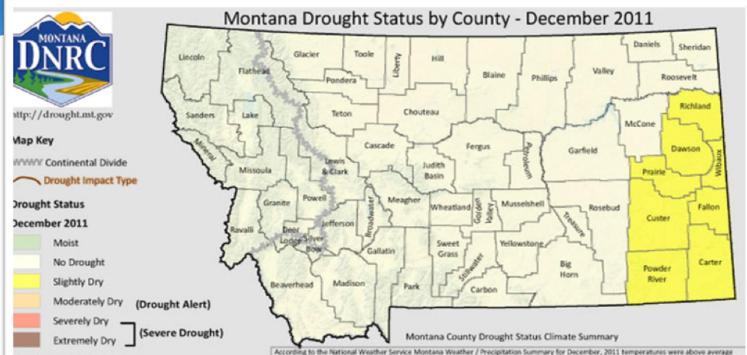
#### Montana Drought Status November 2011



NOAA's Climate Prediction Center November 10 ENSO Update reported the ongoing La Nina Advisory as, "La Nina is expected to continue through the Northern Hemisphere winter 2011-2012." Current conditions and past ENSO records indicate a "weak-to-moderate strength"



# Montana Drought Status December 2011



Prought Impact Types -

a = Agricultural - Soil Moisture, Range conditions

■ Hydrological - Water Supplies, Streamflow, Groundwater

Prought Alert - Governor's Drought

Advisory Committee strongly encourages local officials to convene local drought committees.

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or recommended responses, see the Montana Drought Plan



attrc//nris.mt.eov/drought/

According to the National Weather Service Montana Weather / Precipitation Summary for December, 2011 temperatures were above average across most of Montana for the 6th consecutive month leaving December as the 34th warmest December on record. "For the period of October-through December 2011 precipitation averaged 2.62 inches statewide," very close to normal. However, snowfall was only about 50 percent of normal everaging only 5.2 inches across the state, ending the month with the 25th lowest snowfall of record. The January 4, 2012 NOAA National Snow Analysis Snow Water Equivalent map indicates that almost all of the state's prairie lands are "open" or devoid of snow cover. See: www.nohrs.noaa.gov

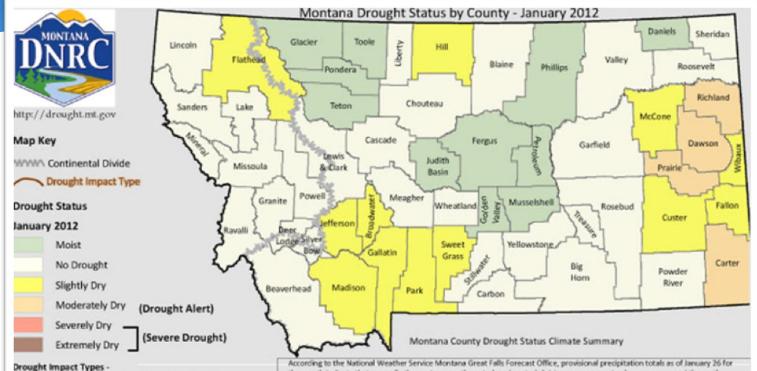
As of January 4, 2012 Natural Resources Conservation Service (NRCS) Snotel network indicates snow water equivalent of the mountain snowpack for the five major Montana river basins west of the Continental Divide ranges from about 80 to 90 percent of average, and between 75 and 90 percent for the 11 river basins east of the Divide, with the exceptions of the Tongue and Lower Yellowstone basins at 134 and 101 percent. NRCS records indicate that for the period of record 1971-2000 the mountain snow accumulation period will be reaching its 50 percent point by mid-tanuary.

The Montana Agricultural Statistics Service Crop Weather Report for December 31, 2011 reported that topsoil and subsoil moisture were at 52 and 51 percent adequate and surplus. Winter wheat condition was rated 30 percent good and excellent and wind damage was 95 percent light and none. Freeze clamage was 100 percent light and none. However, snow cover was rated as 98 percent none and light with range and pasture feed condition 31 percent good to excellent and grazing 84 percent open.

NOAA's Climate Prediction Center (CPC) January 5 BNSO Update reported that "Collectively, the ongoing oceanic and atmospheric conditions reflect the continuation of weak to moderate La Nina." The report goes on to call for increased chance for below average temperatures over the western and north-central U.S. with above average precipitation favored across the northern tier of states. Montana tends to experience cooler, and to a lesser degree, wetter winters during La Nina events.



#### Montana Drought Status January 2012



A = Agricultural - Soil Moisture, Range conditions

H = Hydrological - Water Supplies, Streamflow, Groundwater

Drought Alert - Governor's Drought

Advisory Committee strongly encourages local officials to convene local drought committees.

Severe Drought - Local officials

should have local drought planning efforts underway or should reconvene the local drought committee at the earliest opportunity.

For recommended responses, see the Montana Drought Plan



the month indicate that generally the western, south-central, and central divisions are average to above average, and the northcentral, northeastern, and southwest divisions range from well below to near average with exceptions. According to the Montana Climate Atlas (Caprio & Nielsen 1992) precipitation at valley elevation locations around the state ranges from around 0.50 to 1.00 inch with the exception of Kalispell where over 1.50 inches is expected. "The season of strong Chinooks is well underway as Arctic incursions increase. When Arctic incursions are more frequent, up slope wind flow causes heavy snowfall on the leeward slopes."

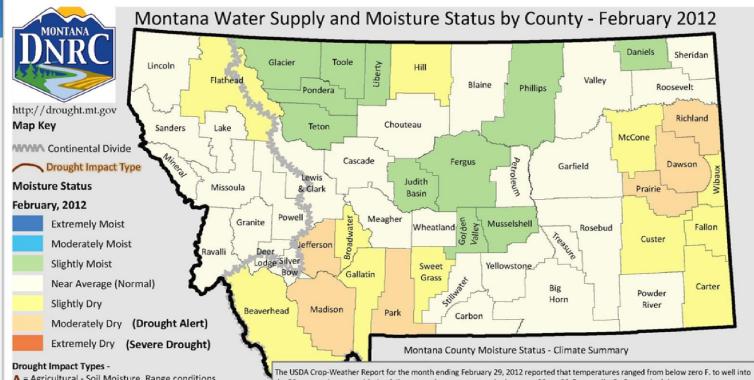
This occurred following a month of very little snowfall when between January 17 and 19, a storm left snowfall totals up to 30 inches in the mountains and up to a foot at valley elevations in the central area of the state. Temperatures had plunged into the single digits for much of the state but moderated into highs in the 40F range by the week of the 23rd. As of January 26, Helena was 413 percent of normal with 1.28 inches for the month or 142 percent of normal for the Water Year, October 1, 2011 to date.

According to the NRCS Snow Survey, Snotel sites in the mountains showed increases in snow water equivalent (SWE) of the snowpack of between 10- and 20-percent between January 18 and the 25th nearly statewide. The Headwaters Mainstern of the Missouri showed a SWE for its mountain snowpack of 109%; the Lower Missouri of 99%; Lower Yellowstone 99%; The Tongue 127%; Bitterroot 94%, but the Missouri headwaters only 78% following the event.

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#### Montana Drought Status February 2012



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H = Hydrological - Water Supplies, Streamflow, Groundwater

Drought Alert - Governor's Drought Advisory Committee strongly encourages local

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http://nris.mt.gov/drought/

the 50s across the state with the daily average low temperature in the upper 20s to 30sF generally. Ft. Benton had the warmest temperature recorded for the month at 56F. West Glacier received 2.77 inches of precipitation for the month, the most of any reporting station in the state. The Montana Climate Atlas indicates that valley elevations across the state typically receive from 0.40 to 0.70 inches for February. The Montana Water Supply and Moisture Status Map by county indicates that there are 6 counties rated as Moderately Dry with 11 counties in each the Slightly Wet and Slightly Dry categories with the remaining counties classified as Near Average.

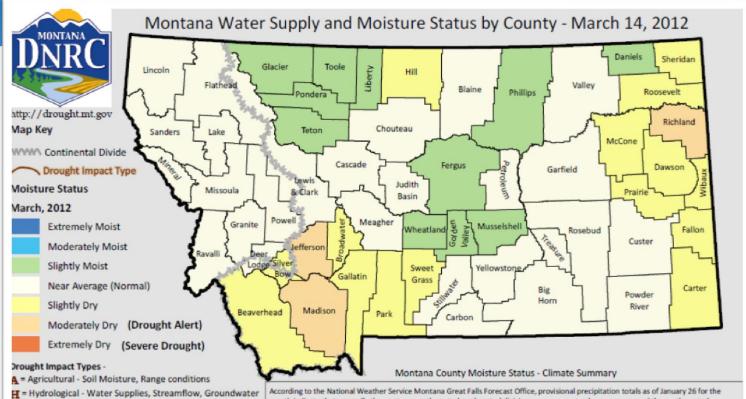
NOAA's Climate Prediction Center (CPC) February 28th 8- to 14-day outlook calls for temperatures to be slightly below average and precipitation to range from slightly above to above average for the western two-thirds of the state. CPC's February 16 one-month forecast for March indicates that the western three -fourths of the state should experience equal chances for above or below temperatures and the northwest corner of the state slightly above average precipitation, with the remainder of the state equal chances for above or below

As of February 28, the NRCS Snow, Water, and Climate Services Snotel network of mountain precipitation gauges indicated that the snow water equivalent (SWE) for the major river basins of the state ranges from 81 percent in the Gallatin to 132 percent for the Tongue River basin. The lowest SWEs are found in the headwaters of the Missouri River basin with the highest SWEs in the Lower Yellowstone River basin. The SWEs of Missouri Mainstem tributaries, which include the Sun, Teton, Marias, Smith, Musselshell, and Judith River basins range from 103to 108 percent of the 30-year average 1971-2000.

NOAA's Climate Prediction Center February 9, 2012 ENSO Update reported the ongoing La Nina Advisory as indicating a continuing "weak-to-moderate strength La Nina" over the remainder of this winter with "a return to ENSO-neutral conditions during the Northern Hemisphere spring, (March through May) which are likely to continue into the summer." Montana experiences cooler and wetter conditions during La Nina winters generally with little predictability before mid-September and out past May 1.



#### Montana Drought Status March 2012



Drought Alert - Governor's Drought Advisory Committee strongly encourages local officials to convene local drought committees.

Severe Drought - Local officials

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# Governor's Drought Advisory Committee

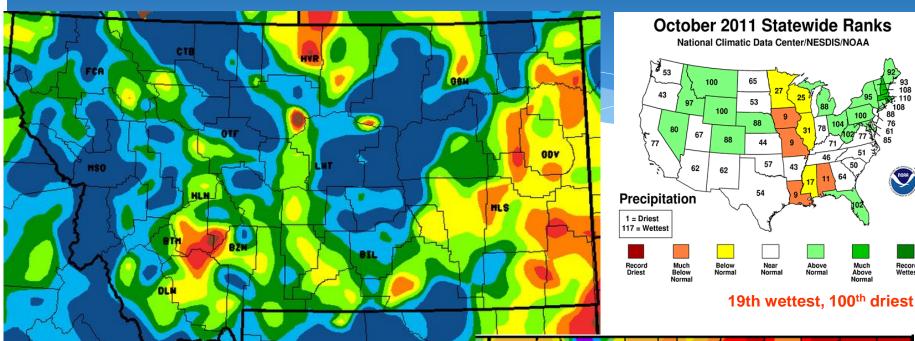
March 15, 2012 National Weather Service Gina Loss







#### Percent of Normal Precipitation October 2011

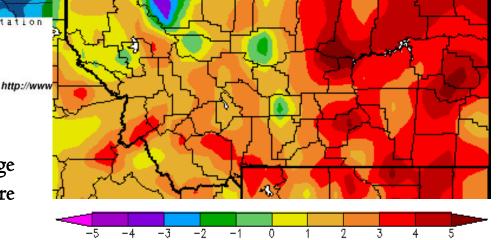


October 2011 Percent of Normal Precipitation
Period of Normal: 1981-2010

85 115 150 200

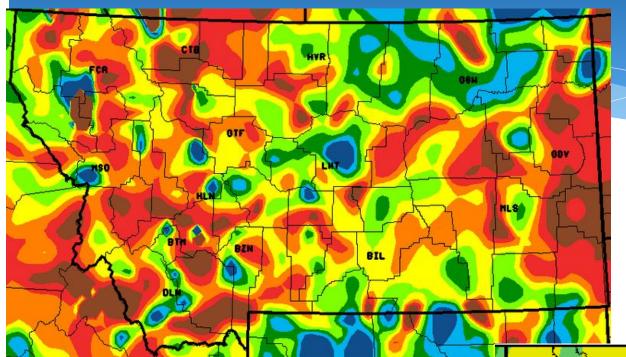
NOTE: Data used to generate this image are PROVISIONAL AND SUBJECT TO CHANGE.

Departure from average temperature





#### Percent of Normal Precipitation November 2011



# November 2011 Statewide Ranks National Climatic Data Center/NESDIS/NOAA 12 9 63 94 44 12 9 63 94 44 71 48 96 112 110 100 22 72 Precipitation 1 = Driest 117 = Wettest Record Much Below Near Above Much Record

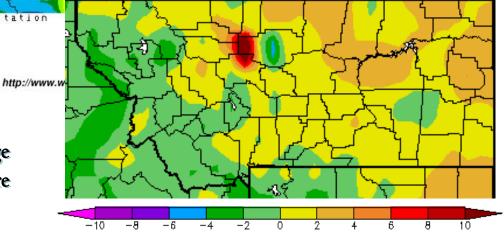
44th driest, 75th wettest

November 2011 Percent of Normal Precipitation
Period of Hermal: 1381-2010

20 40 60 85 115 150 200

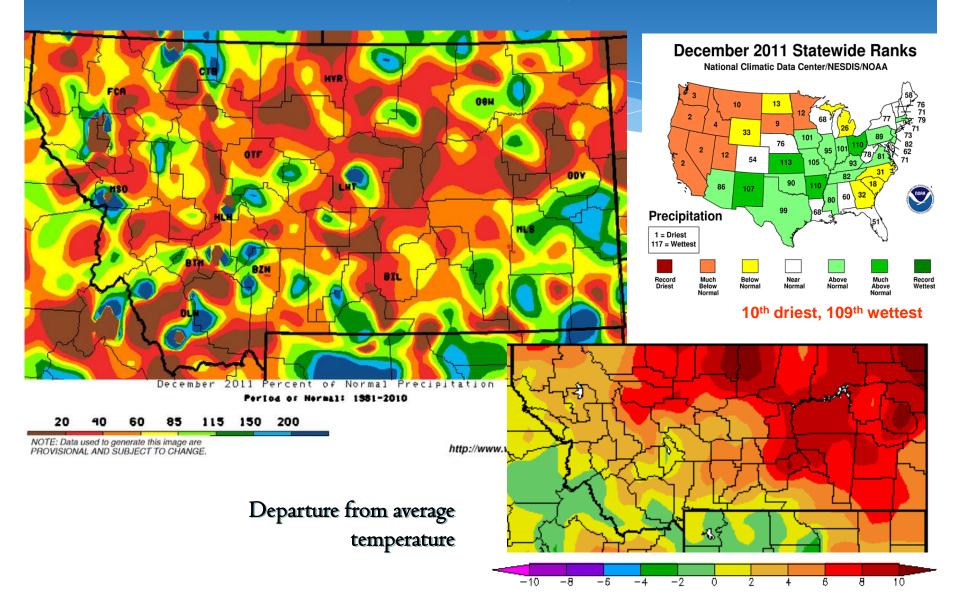
NOTE: Data used to generate this image are PROVISIONAL AND SUBJECT TO CHANGE.

Departure from average temperature



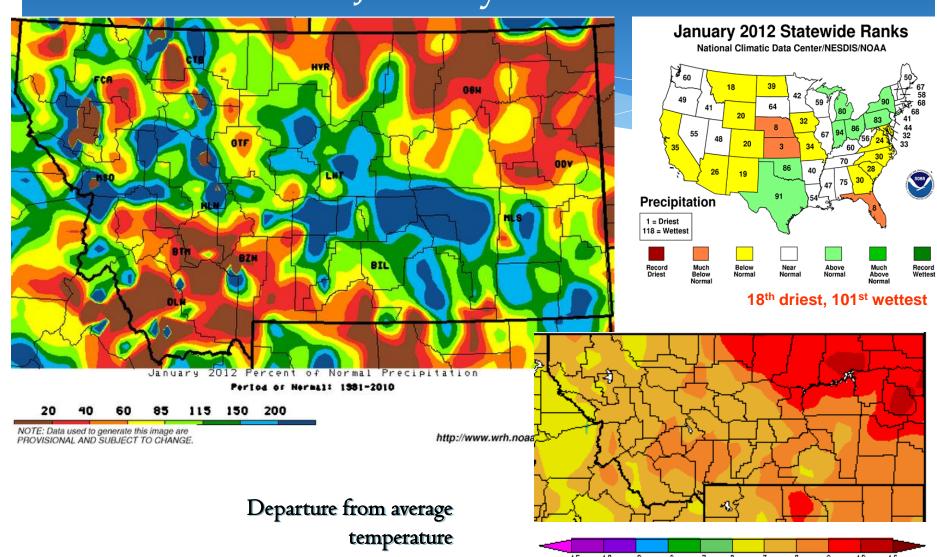


# Percent of Normal Precipitation December 2011



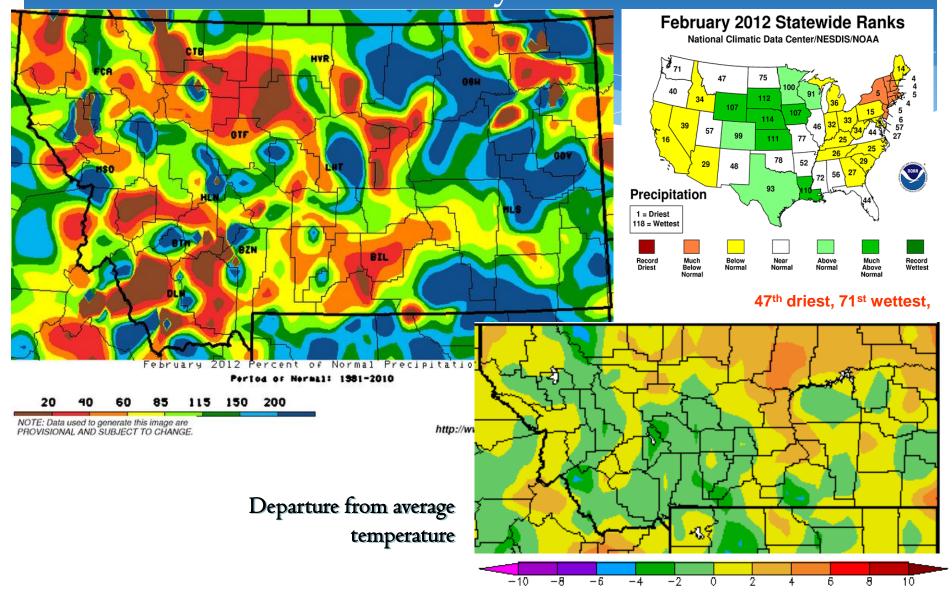


#### Percent of Normal Precipitation January 2012



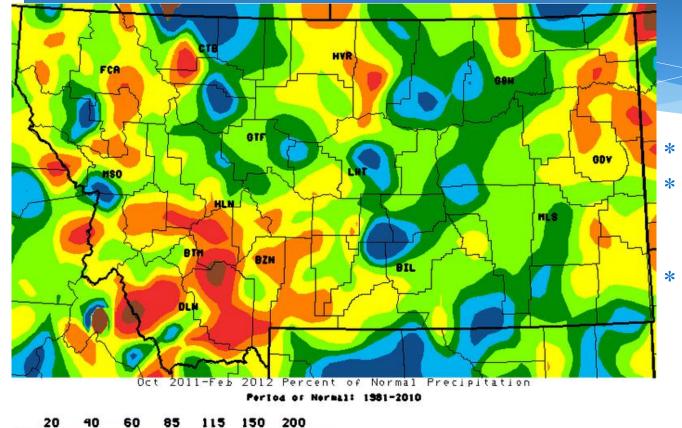
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#### Percent of Normal Precipitation February 2012





## Percent of Normal Precipitation Water Year 2012

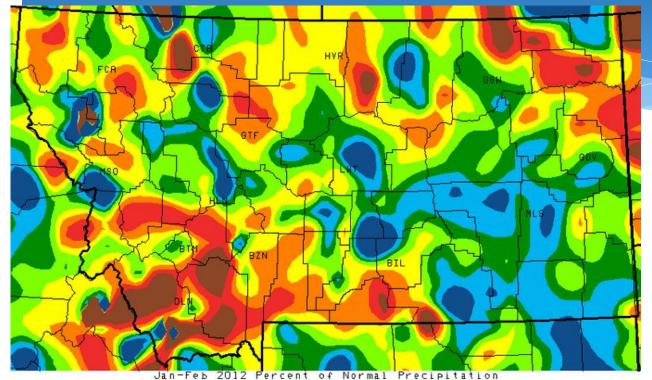


- \* October February
- \* Most of Montana averaging near to above normal
- \* Southwest and east averaging near to below normal

NOTE: Data used to generate this image are PROVISIONAL AND SUBJECT TO CHANGE.



#### Percent of Normal Precipitation Calendar Year 2012



- Period of Normal: 1981-2010

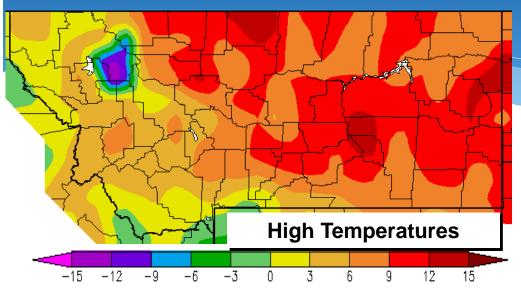
NOTE: Data used to generate this image are PROVISIONAL AND SUBJECT TO CHANGE.

http://www.wrh.noaa.gov/Greatfalls

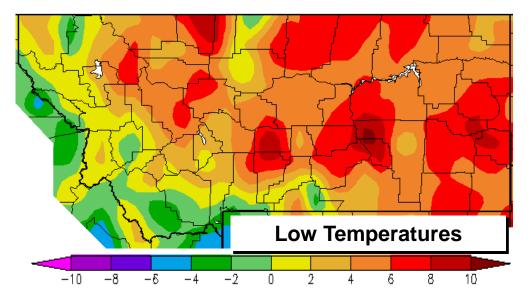
- January February
- Below to well below normal southwest and northeast
- Above to well above normal central and southeast



#### Temperature Anomalies March 1 – 12, 2012

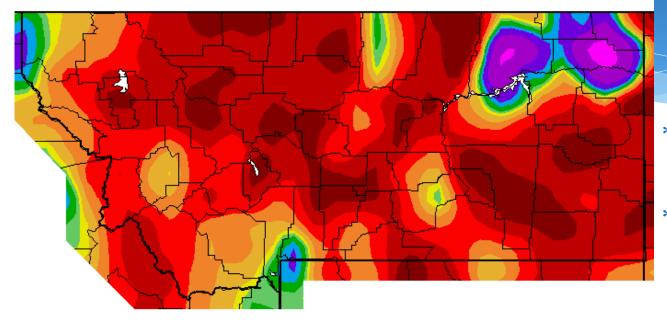


- \* Temperatures averaging near to above normal
- \* Highs
  - \* West/southwest 0-6 degrees above normal
  - \* Central/east 6-15 degrees above normal
- \* Lows
  - \* West/southwest near normal
  - \* Central/east 2-10 degrees above normal

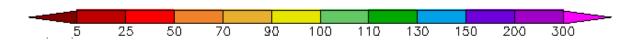




#### Percent of Average Precipitation March 1 – 12

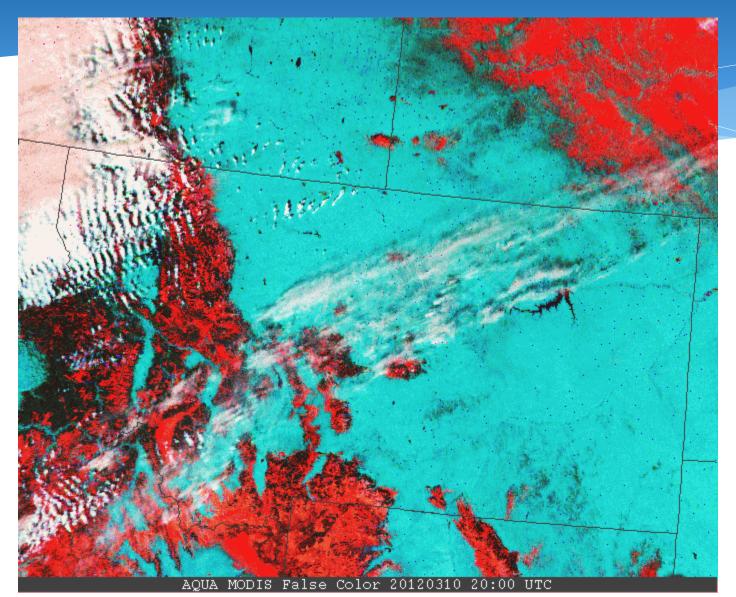


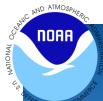
- Well below normal over much of Montana
- \* Near to well above normal in the northeast corner of Montana



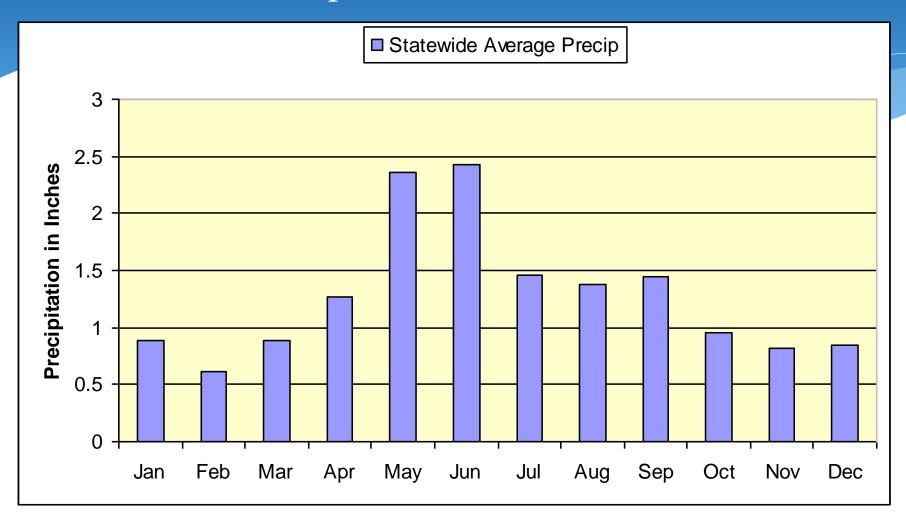


#### MODIS Satellite Imagery March 10, 2012



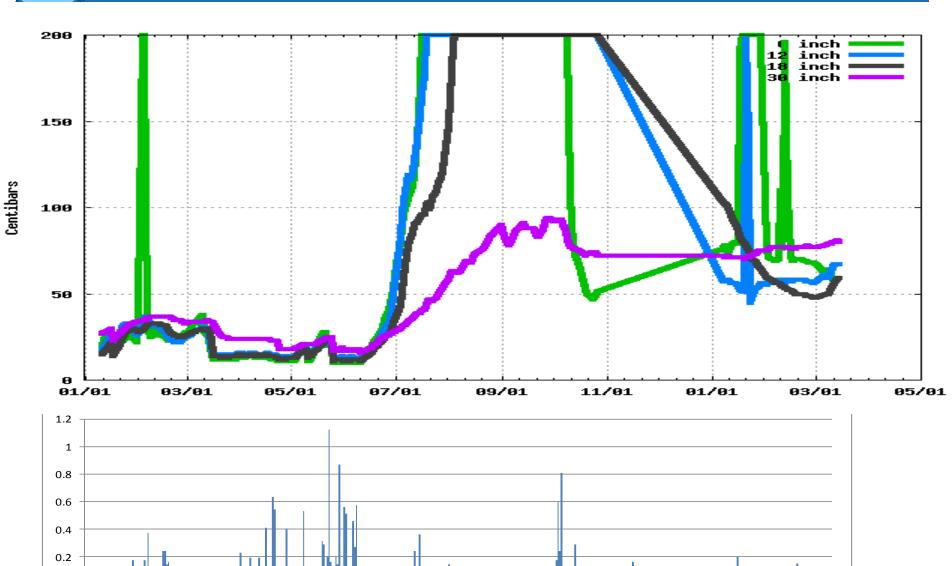


#### Statewide Average Precipitation March still on par with other winter months



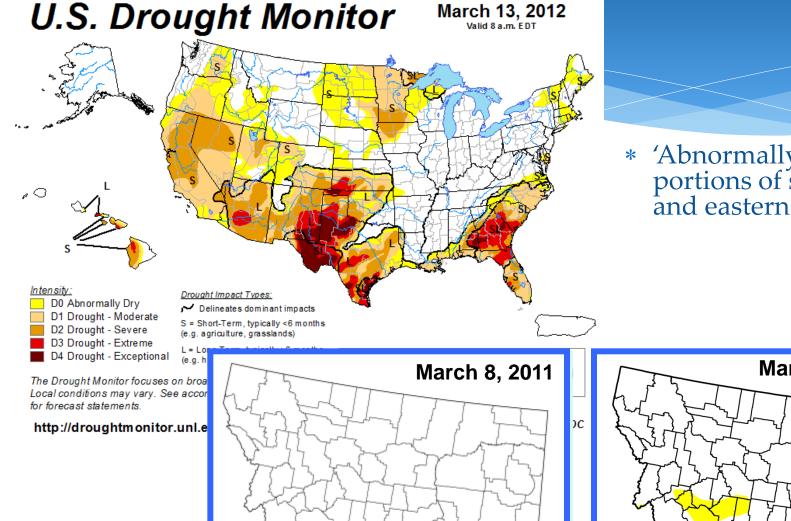


#### Great Falls Soil Moisture

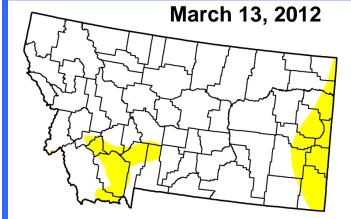




#### National Drought Monitor Issued March 13, 2012

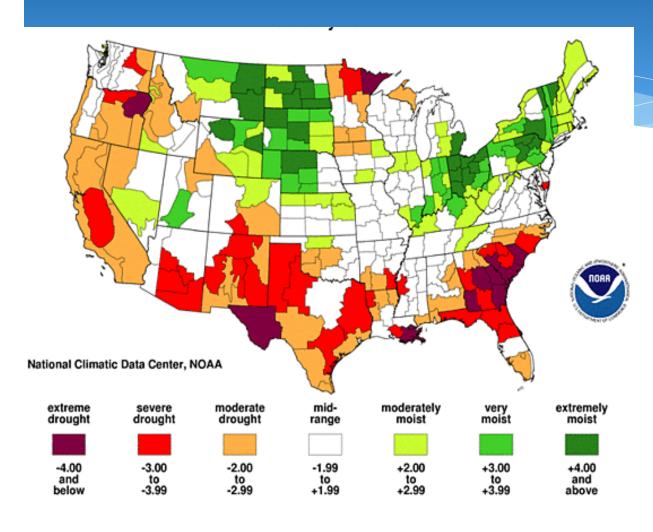


'Abnormally Dry' in portions of southwest and eastern Montana



#### NORA

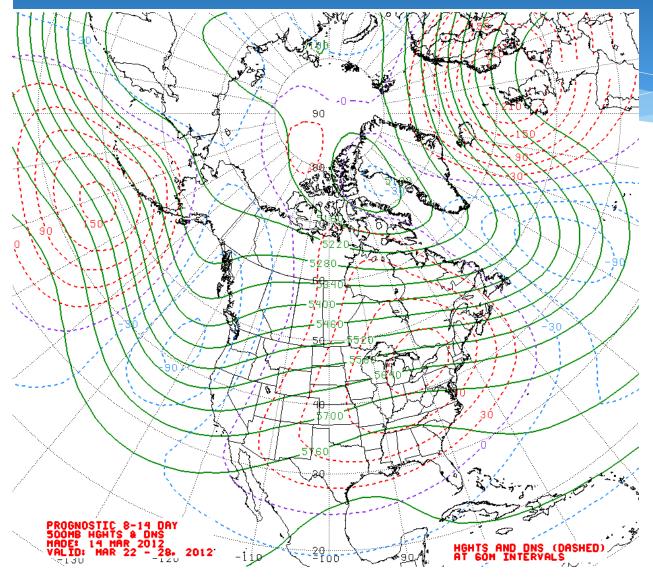
#### Palmer Hydrological Drought Index February 2012



- \* 'Extremely Moist'
  - \* Northeast
  - \* Southeast
- \* 'Very Moist'
  - \* North central
- \* 'Moderately Moist'
  - \* Central
- \* 'Mid-Range'
  - \* West
  - South central
- \* 'Moderate Drought'
  - \* Southwest



#### 8 to 14 Day Outlook 500mb Heights and Anomalies



\* Southwesterly flow aloft into Montana

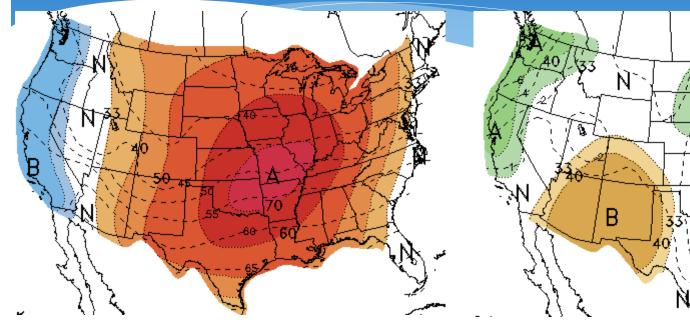


#### 8 to 14 Day Outlook

March 22 – 28, 2012

#### **Temperature**

#### **Precipitation**



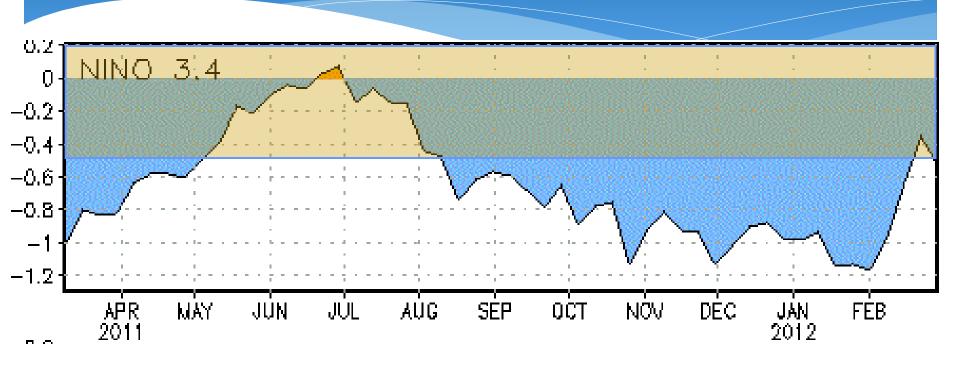
- AO 33 N AO B B B B B
- \* 33% to 40% chance temperatures will be above normal over western half of Montana
- \* 40% to 50% chance temperatures will be above normal over eastern half

- \* 33% to 40% chance precipitation will be above normal over northwest corner
- \* Equal chances precipitation will be above, below or near normal remainder of Montana



#### El Niño / La Niña

La Niña is expected to transition to ENSO-neutral conditions by the end of April 2012.

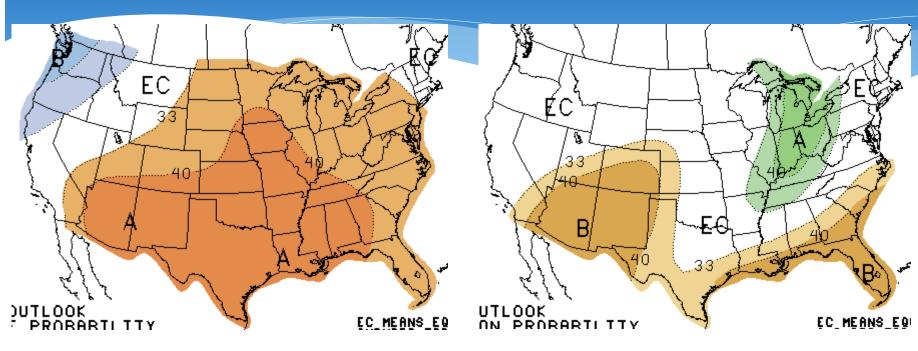




#### April Outlook

#### **Temperature**

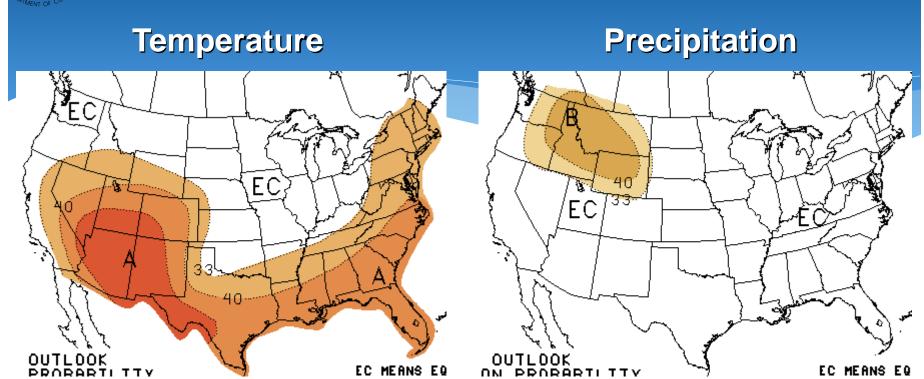
#### **Precipitation**



- \* Equal chances temperatures will be above, below or near normal across Montana
- \* Equal chances precipitation will be above, below or near normal across Montana



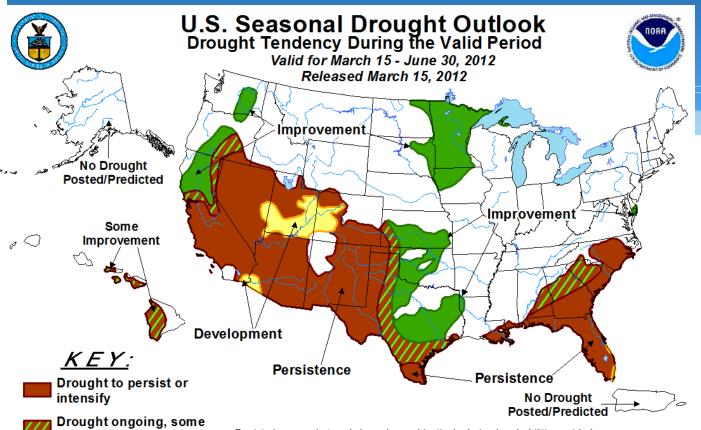
#### May – July Outlook



- \* Equal chances temperatures will be above, below or near normal across Montana
- \* 33% to 50% chance precipitation will be below normal across Montana



## Drought Outlook through June Issued March 15, 2012



\* No drought development forecast for Montana through June

improvement

Drought likely to improve, impacts ease

Depicts larg by short- ar -- such as i Use caution "Ongoing" of

Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.



#### In Summary...

- \* Montana has experienced above normal temperatures and below normal precipitation across much of the state through the 2011-2012 winter
- \* Chances for flooding this year are low
- \* Forecast calling for equal chances for above, below or near normal temperatures and precipitation through April
- \* Forecast calling for equal chances for above, below or near normal temperatures with better chances for below normal precipitation May through July



#### weather.gov

weather.gov/billings weather.gov/glasgow weather.gov/missoula weather.gov/greatfalls

